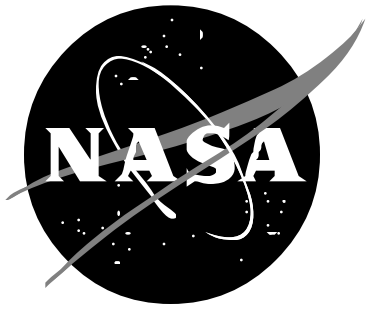

National Aeronautics and Space Administration

May 1, 1998
AO 98-OSS-05

Solar-B Announcement of Opportunity

Notice of Intent Due: **June 1, 1998**
Proposals Due: **August 3, 1998**

TABLE OF CONTENTS

APPENDICES

ANNOUNCEMENT OF OPPORTUNITY
FOR
U.S. PARTICIPATION IN THE
JAPANESE SOLAR-B MISSION

1.0 DESCRIPTION OF THE OPPORTUNITY

1.1 Overall Description

The Institute of Space and Astronautical Science (ISAS) of Japan is proposing a new space mission for studying the Sun that is currently identified as Solar-B. It is planned for launch into a Sun-synchronous polar orbit in the year 2004. ISAS has invited participation by United States (U.S.) scientists in the Solar-B mission through the National Aeronautics and Space Administration (NASA). This Announcement of Opportunity (AO) from NASA is in direct response to this invitation by ISAS. The opportunity for participation by U.S. scientists in a Japanese space program will be conducted under the aegis of the U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology. Due to the nature of NASA's agreement with ISAS for this opportunity, only investigations submitted from U.S. institutions will be selected in response to this AO, and only science personnel in residence at U.S. institutions may be affiliated with proposals to this AO.

The primary goal of the Solar-B mission is to advance our understanding of the origin of the outer solar atmosphere, the corona, and of the coupling between the fine magnetic structure at the photosphere and the dynamic processes occurring in the corona. Solar-B will, therefore, continue the systematic study of the relationship between solar processes and the magnetic field that was begun by the NASA Solar Maximum Mission (1981), the ISAS Hinotori (1981) and Yohkoh (1991) missions, and the European Space Agency (ESA)/NASA Solar and Heliospheric Observatory (1995). Together, these missions will have spanned almost two complete solar cycles. It is the intent of ISAS to launch Solar-B in 2004 in order to make observations during the declining phase of the current activity cycle that is expected to reach its maximum in about the year 2000.

The Solar-B mission, as conceived by ISAS, will be a multilateral international collaboration including Japan, the United States, and the United Kingdom. In this and in all other programmatic aspects Solar-B will follow the very successful Yohkoh (Solar-A) model. The major mission elements, spacecraft, launch services, etc., will be provided by ISAS. The international partners will provide scientific research investigations that include:

- -- the design, development, and delivery of flight hardware, in the form of either complete instruments or major components of these instruments, to ISAS;
- -- participation in mission operations and data acquisition and assistance in the assembly of the data from all instruments into a unified set, which will then be available for analysis by all participating scientists; and
- -- the analysis and timely publication of research articles based on the data from Solar-B.

ISAS has proposed an instrument complement for Solar-B consisting of:

(1) a diffraction-limited optical telescope of 0.5 m diameter aperture to image the photosphere and chromosphere (to be provided by Japan) with focal plane instruments to record vector magnetograms, Dopplergrams, and filtergrams;
(2) an x-ray telescope for imaging the high temperature (0.5 to 10 MK) corona; and
(3) an extreme-ultraviolet (EUV) imaging spectrometer (EIS) to determine velocity fields and other plasma parameters in the corona and transition region.

In the discussions held among the participating Agencies, it has been agreed that the United States' main contribution will be the focal plane instrumentation for the optical telescope and a significant contribution to the x-ray telescope. The United Kingdom will be responsible for the EUV imaging spectrometer with a U.S. contribution.

U.S. proposals in response to this solicitation shall present broad scientific investigations that will contribute to the total mission and not just to the interpretation of the data from the particular instrument they propose to provide. They shall also describe the instrumentation that they wish to contribute to the Solar-B mission and how it supports the overall mission goals and objectives. Since, at this time, the precise details of the U.S. contribution have not been negotiated with ISAS, U.S. investigators should propose investigations whose completion requires:

-- Complete, stand-alone focal plane instruments for the optical telescope, and/or
-- Complete, stand-alone soft x-ray telescopes, and/or
-- Optical systems for the EUV imaging spectrometer.

It has been agreed that a Japanese scientist will be the Principal Investigator for each specific investigation and will provide various subsystems of each instrument, including perhaps its control and data processing systems in order to ensure that the interfaces of the scientific instruments properly match the spacecraft. With the aid of the combined Japanese and U.S. science team, this Japanese Principal Investigator will also be responsible for experiment integration and mission operations. For U.S. contractural purposes, however, proposals to this NASA AO shall be from U.S. Principal Investigator-lead teams with Co-Investigators.

There are two important elements of the intended U.S.-Japan cooperative program to note. First, U.S. scientists selected through this AO will join the overall Solar-B mission science team headed by a Japanese Project Manager and Project Scientist. Second, many of the U.S. scientists selected through this AO will be expected to spend substantial time in Japan in order to participate in the Solar-B mission development, flight operations, and data analysis activities under the guidance of a Japanese Project Manager and Project Scientist. Further important information on the functions of the U.S. Solar-B Investigation Team is presented in Section 5.2.

Two additional important programmatic considerations should also be noted. First, although ISAS has indicated that final approval and funding for the Solar-B mission within Japan is anticipated, it is not final as of the date of this AO. Therefore, in the event that Solar-B is not formally approved, this Announcement of Opportunity does not constitute an obligation on the part of the U.S. Government to carry any selected U.S. investigation through to completion. Second, in the event that Solar-B is formally approved in Japan for implementation, confirmation of any selections made from the responses to this AO for final development for flight shall be

contingent upon the availability of appropriate NASA funding and the conclusion of an appropriate agreement between NASA and ISAS, and NASA and the U.K. Particle Physics and Astronomy Research Council (PPARC) in the case of the EIS.

1.2 NASA Resources Available for Solar-B

NASA expects to fund the selected U.S. Solar-B science investigations as the second Solar Terrestrial Probe, consistent with the recommendations of the Sun-Earth Connection Advisory Subcommittee (SECAS) and the Space Science Advisory Committee (SSAC) (see Appendix D). Proposing U.S. scientists should recognize that the resources available for U.S. participation in Solar-B are cost-capped and propose accordingly. As a guideline, the total value of investigations selected for the U.S. contribution to the Solar-B mission through launch plus thirty days is approximately $50M in real-year dollars. The mission is expected to launch in February 2004. Of this amount, approximately $2M is allocated for seven-month firm, fixed-price Phase A contracts for studies. The balance of the NASA funding available will be held for risk management.

1.3 Specific Provisions

This AO invites proposals for scientific investigations that both provide as well as use the data from the focal plane package of the optical telescope, from the soft x-ray telescope, and from the EUV imaging spectrometer. For purposes of the optical telescope, two different techniques have been applied to the measurement of the solar vector magnetic field. The first employs a filtergraph approach, the second a spectrograph (see section 3.1). Proposals for investigations that provide either of these instruments, or that combine both instruments within a single investigation, are acceptable. Proposals for the filter vector magnetograph should also include the capability to take broad band diffraction-limited filtergrams. All proposals, whether for a single or dual magnetograph, must include a description of the method they plan for implementation of image motion compensation.

Proposers for the soft x-ray telescope may propose either normal or grazing incidence telescopes that provide good temperature coverage of coronal material. The angular resolution must provide at least a factor of two improvement over that from Yohkoh, and, although instruments that provide full disk coverage are desirable, they are not required. The primary factor in the selection of this telescope will be the ability of the proposed design to meet the scientific requirements of the Solar-B mission (see Section 5.1).

Proposals for participation in the EUV imaging spectrometer that will be provided by the U.K. will be considered. Any such proposals must show evidence that the U.K. supporting organization (PPARC) intends to fund the EIS instrument and that the proposed U.S. investigation is acceptable to the selected U.K. Principal Investigator.

Proposals submitted in response to this AO must be for complete research investigations encompassing all mission phases. For the purposes of this AO, mission phases are defined to be: Phase A – concept study; Phase B – definition and preliminary design; Phase C – detailed design; Phase D – development through launch plus 30 days; and Phase E – mission operations and data analysis. Phase E is to include analysis and publication of data in the peer reviewed scientific literature and delivery of the data to the appropriate data archive. Confirmations for flight will be made near the end of Phase B based on the information generated during the study period,

documented in the concept study report (See Appendix F), and assessed at the Non-Advocacy Review. The primary discriminator will be how well each instrument contributes to the overall scientific objectives as may be affected by technical and cost considerations. Note that this is a single-step selection process. It is fully expected that any selected proposal will be confirmed for flight, pending satisfactory reviews and progress.

Proposers must estimate the Total NASA Investigation Cost in their proposals and, if selected through this AO, in much more detail in the concept study report. The specific cost information required for the current proposals is contained in Appendix B. Since cost details are not anticipated until the conclusion of the concept study, cost estimates in the proposal may be generated with models or cost estimating relationships from analogous investigations. However, during any phase of the investigation (except Phase E), the estimated cost to NASA of the total for all investigations must not exceed the NASA cost constraint. Individual investigations may be descoped to meet cost restraints. Therefore, the proposer shall identify a prioritized plan for removal of science objectives along with the estimated cost savings.

The Total NASA Investigation Cost is defined as all costs that are necessary to complete an investigation beginning with Phase A through Phase E, including reserves and contract fees. In general, proposers should assume all costs must be included unless specifically excluded. Examples of costs to be included are: education/public outreach activities; development of new technology; subcontracting costs (including fees); costs for all science team personnel required to conduct the investigation, analyze and publish results, and deliver data in archival format; insurance; ground-data system; and all labor, both contractor and civil servant.

2.0 ANNOUNCEMENT OBJECTIVES

The primary objective for U.S. participation in the Solar-B mission, as solicited by NASA in this Announcement, is to observe and then understand the basic physical processes involved in the generation of the solar magnetic field, its transport and dissipation in the solar atmosphere, and in the methods by which the magnetic field modulates the Sun's luminosity as revealed in both spectral and imaging data from the visible, extreme UV, and soft x-ray emissions. Special emphasis is placed on the relationship between phenomena observed in the visible spectrum (photosphere) to phenomena in the EUV and soft x-ray region (transition region and corona).

By "observe" is meant acquisition of those data that allow the physical parameters of solar atmospheric process to be quantified. These include both components of the magnetic field in order to determine the full vector field, electron and ion densities and temperatures, elemental abundances, and photospheric and coronal velocity fields with adequate spatial and temporal resolution to resolve and follow the processes under study.
By "understand" is meant the interpretation of these data in terms of the laws of physics, in order to develop quantitative, physical descriptions of the processes and mechanisms by which the energy of the magnetic field is transported, stored, and released to power solar phenomena, and how the fine scale variability observed in the photosphere couples into the larger scale coronal phenomena.

A more detailed description of the overall Solar-B mission objectives is given in *The Solar-B Mission: Final Report of the Science Definition Team (SDT)*, which may be found on the World Wide Web at <http://wwwssl.msfc.nasa.gov/ssl/pad/solar/sdt-rpt.htm>.

This study report was produced by a NASA-sponsored group of U.S. scientists formed under the auspices of the Mechanisms of Solar Variability Science Working Group and who have met with their Japanese colleagues and ISAS several times since July 1994. It is intended to provide only background information to prospective proposers. In case of a conflict between concepts outlined in this AO and those in the study report, the provisions of this AO take precedence. In particular, to be considered responsive to this Announcement, proposed investigations must address the objectives described in this section (Section 2.0).

3.0 BACKGROUND

3.1 Previous Solar Missions

The first high resolution x-ray images of the Sun, taken by suborbital rocket instruments in the late 1960's and dramatically confirmed by observations from Skylab (1973–4), shattered the paradigm of a relatively homogeneous, isotropic corona and replaced it with a highly organized corona in which the magnetic field plays the dominant role. This view has been expanded by observations from the Soft X-ray Telescope (SXT) on Yohkoh (1991–present) and SOHO (1995–present) that show that the solar corona undergoes continuous change on every scale from structures that affect the whole Sun down to tiny loops at the resolution limits. This view has replaced the previous picture of the quiescent corona with a new, extremely dynamic picture. The observations strongly suggest that a magnetic reconnection process is responsible for the coronal activity but a quantitative description of this mechanism remains to be demonstrated, in part because the measurements of the magnetic field have not yet reached the required accuracy. This goal has long been recognized, however, and over this same thirty year time period the capability of ground-based observatories to measure the full vector magnetic field has greatly improved. The observations have clearly demonstrated that the field is frequently nonpotential, that is, it has the capacity to store energy. Comparison of observations from the Solar Maximum Mission (1980) with vector magnetic field data demonstrated that, at least for large dynamic events, nonpotentiality of the field (often referred to as shear) is a necessary but not sufficient condition for solar activity.

The ground-based observations upon which these conclusions are drawn have limited spatial and temporal resolution and marginal sensitivity. This is a direct result of the limitations imposed on the observations by the variability of the Earth's atmosphere. To measure the vector magnetic field, an analysis of the states of polarization of magnetically sensitive absorption lines is required. Two complementary approaches, filtergraph and spectrograph, have been developed. Spectrographs measure full line profiles in all four components of the Stokes vector for each individual spatial pixel, while filtergraphs select a specific waveband on the line profile and measure the four polarization intensities at each point in a spatial array of pixels. The spectrograph measurements of magnetic field B are precise and quantitative, but take a time (~hour) to scan an active region that is long compared to the active region variability. The filtergraph makes less precise observations and has to be calibrated against spectrographic observations, but can scan an entire active region in 2–3 minutes, rapidly enough to follow the evolution of the magnetic field. The technological development of these instruments has reached the stage where they can be considered for space flight, where the observations would be free of the dominant noise factor from atmospheric "seeing," and where uninterrupted data sequences are possible. Under these conditions an order of magnitude improvement in the measurement of the structure and the changes in the magnetic field is possible.

The results from these earlier missions and from ground-based observations have shown that combined higher angular resolution and higher magnetic sensitivity measurements are essential to further advances in understanding the mechanisms of solar variability. Consequently, planning for the next solar mission has focused on the development of a payload that will have as its centerpiece a large optical telescope to measure vector magnetic fields. The angular resolution (0.2 arc sec) of this telescope is adequate to isolate the elemental flux tubes that make up the magnetic field at the photosphere. In addition, the scientists planning the Solar-B mission recognize that it is necessary to augment the photospheric observations with coronal images having a factor of two improvement in angular resolution compared to Yohkoh and with coronal spectral observations in the EUV for determining densities, temperatures, and velocities.

3.2 History of Japanese-U.S. Solar Research Leading to Solar-B

Joint U.S.-Japanese cooperation in solar physics has a long history. Japanese scientists have been regular visitors to U.S. solar ground-based observatories for three decades as part of the NASA/ISAS science cooperation program, which includes collaborative research in solar physics. Solar Maximum Mission (SMM) and HINOTORI were simultaneously and independently planned by NASA and ISAS, respectively, with formal cooperative relationships between the scientists for those missions subsequently being established. This collaboration at first involved only the exchange of observing schedules, but later evolved to include exchanges of data and joint participation in data analysis projects.

This positive experience led to discussions for a closer collaboration, first between Japanese and U.S. solar scientists in 1983 and, in the following year, between ISAS and NASA officials. The result of these discussions was an informal decision to proceed with a joint mission to be led by ISAS. Subsequently, during the summer and fall of 1985, there was an exchange of letters between ISAS and NASA in which ISAS offered, and NASA accepted, the opportunity for direct involvement of U.S. scientists in the Yohkoh (Solar-A) mission. The level of U.S. involvement was to provide a soft x-ray telescope (SXT) to complement the hard x-ray telescope (HXT) that would be provided by ISAS. The implementation of this joint program has been highly successful with the Japanese and U.S. scientists working together as a team that continues to produce exciting results and discoveries.

3.3 Programmatic Recommendations to NASA

Although the concept of a specific joint Japanese-U.S. space mission to study the magnetic coupling between the photosphere and the corona is recent, the magnetic influence on eruptive phenomena and on coronal heating have bearing on two of the oldest and most important objectives of the U.S. solar space program. The report of the Astronomy Survey Committee of the National Academy of Science (NAS) entitled *Astronomy and Astrophysics for the 1980's*, (NAS, 1982) explicitly recommended a solar optical telescope that "...will, for the first time, be able to see the structure of the magnetic flux tubes and the details of the convection around them." Subsequently, the *Space Physics Strategy-Implementation Study – The NASA Space Physics Program for 1995–2010* (NASA, 1991) described the Orbiting Solar Laboratory as its highest priority mission. Although this mission was not approved for flight owing to budgetary considerations, the importance of its mission goals and objectives remain for straightforward reasons (see Appendix D).

In particular, the physical processes that structure the solar atmosphere have relative small characteristic lengths. For instance, the density scale height in the photosphere is on the order of 100 km (0.15 arcsec). The magnetic flux tubes that comprise the magnetic field are below the limit of resolution of ground-based telescopes but are believed, based on filling factor arguments, to have cross-sections of ~ 200 km (0.3 arcsec). If the important problems of the heating of the upper solar atmosphere and of the storage of magnetic energy and its violent release in transient and eruptive phenomena are to be solved, observations that have not been spatially blurred by atmospheric seeing are required. The physical quantities deduced from such blurred measurements may apply to an average within the measured volume of the quantity, but because of extreme nonlinearities they may not apply to any physically realizable state. Given this background, the ISAS-NASA Solar-B opportunity was specifically endorsed by the Sun-Earth Connections Advisory Subcommittee (SECAS) in April 1997 and the Space Science Advisory Committee (see Appendix D) in May 1997.

4.0 PROPOSAL OPPORTUNITY PERIOD

The schedule of events associated with this Announcement of Opportunity is as follows:

Release AO	May 1, 1998
Preproposal Briefing (see Section 6.1)	May 22, 1998
Notice of Intent due (see Section 6.1)	June 1, 1998
Release Model Phase A Contract	June 15, 1998
Proposal Deadline	August 3, 1998
Selection of investigations	October 1998
Award of Phase A Study Contracts (see Section 7.3)	December 1998

5.0 REQUIREMENTS AND CONSTRAINTS

5.1 Description of the Solar-B Mission

5.1.1 Mission Objectives

The Solar-B mission will, for the first time, provide quantitative measurements of the Sun's full vector magnetic field on scales dominated by elemental photospheric flux tubes. The field of view and sensitivity should allow changes in the magnetic energy to be related to both steady state (coronal heating) and transient changes (flares, coronal mass ejections) in the solar atmosphere.

Past missions (Hinotori, SMM, Yohkoh, and SOHO) have shown that the solar atmosphere is permeated by the magnetic field that controls its heating and dynamic behavior. However, the details of such processes remain unclear. All of these missions have relied upon ground-based observations of the magnetic field that are limited in spatial resolution and temporal coverage by the terrestrial atmosphere.

At and immediately below the photosphere, the field appears to be separated into elemental flux tubes. The interactions between the magnetic field in these tubes and the convective motions seem to be fundamental to both surface field evolution and atmospheric heating. To address both solar activity and heating, we must progress in our understanding of the basic physics of these interactions. Measurements from space of the magnetic field in fine scales at these heights is required.

Full details of the Solar-B mission science objectives, instrumentation, and spacecraft can be found in *The Solar-B Mission: Final Report of the Science Definition Team*, which is found on the World Wide Web at <http://wwwssl.msfc.nasa.gov/ssl/pad/solar/sdt-rpt.htm>. Proposers unable to access the WWW can request a hard copy of this SDT Report by E-mail to <deb.tripp@hq.nasa.gov>. However, to be considered responsive to this Announcement, proposed investigations must address the objectives described in Section 2. This SDT Report is intended to provide only background information to prospective proposers.

5.1.2 Candidate Instruments for the Model Payload

In order to give prospective U.S. proposers the fullest possible understanding of the Solar-B mission, ISAS has provided the following description of the Solar-B payload. More details are also available in the Solar-B SDT Report. At the time of the writing of this AO, the specifications indicated here in Section 5.1 are preliminary. Any variations on these specifications will be noted at the time of the Preproposal Briefing (see schedule is Section 4.0). The specifications established at the Preproposal Briefing will be the ones against which the proposals will be judged for selection purposes. Proposers should be aware, therefore, that, if they are selected, they may be asked to revise their proposed hardware as needed to meet slightly different spacecraft and mission requirements and specifications.

The Optical Telescope/Magnetograph

The optical telescope, to be provided by ISAS, is expected to be a diffraction-limited, aplanatic Gregorian with an aperture of 0.5 m. It will have a synthetic f-ratio between 7 and 11 depending on the detailed design. The field of view of the telescope, limited by the size of the hole in the heat reflecting mirror, is about 400 x 400 arcsec. The field of view is also limited by the off-axis 0aberration. A collimating lens may be placed in the center of the primary mirror to relax the positioning tolerance of the focal plane package.

The Focal Plane Package

The Focal Plane Package (FPP) of the main telescope is expected to contain two scientific instruments: a filter vector magnetograph and a spectro-polarimeter (spectrograph), both briefly described below. Any focal plane instrument proposed through this AO must provide an Image Motion Compensation (IMC) system, located at the focal plane, that might use a tip-tilt mirror to compensate for small excursions of the image arising from spacecraft drift, mechanism-induced vibration, and/or wobble of the image introduced by the rotating waveplate. An example of the way this may be done is by active tracking of the solar scene being observed. Any moving parts within any of the above instruments proposed by investigators to this AO should also have momentum compensation mechanisms such as counter wheels to minimize any possible

disturbance on the spacecraft attitude. If the moments of inertia of the moving parts are small enough, the mechanism may not have to be equipped with the compensation mechanism; this will be determined during the Phase A study. NASA's primary hardware responsibility is for the FPP (e.g., complete, stand-alone instruments including design concepts and components) and will provide science investigations whose completion require data taken by the instruments in the FPP:

- The Filter Vector Magnetograph

  The Filter Vector Magnetograph (FVM) should have the capability to act as a Broad Band Filter (BBF) instrument that should preserve the highest angular resolution of which the telescope is capable. The spectral range is expected to be selectable to allow images of different heights in the solar atmosphere to be taken.

  The FVM instrument is expected to maintain the same imaging quality as in its BBF capability but also provide higher spectral resolution (~50,000) and rapid tunability over a selection of spectral lines covering the range from about 390-430 through 666 nm. The wavelength shift due to the orbital motion of the spacecraft should be compensated. The magnetograph must be capable of measuring all four components of the Stokes vector with a temporal resolution of at least 10 seconds.

  In addition to at least one line for high-quality photospheric vector magnetic field information, the selectable spectral lines are expected to include at least one line without Zeeman sensitivity to enable high-quality Doppler measurements to be made.

- The Spectro-Polarimeter (Spectrograph)

  The Spectro-Polarimeter may be a grating-type spectrograph with a polarimeter. The full spectral information of the Stokes vector has to be obtained to achieve a precise measurement of the photospheric magnetic field. A scanning mirror is used to translate the image of the Sun across the entrance slit of the spectrograph to produce spectrally resolved spatial maps. The spectrograph is expected to operate somewhere within the spectral range of 450-666 nm.

The Soft X-Ray Telescope

NASA is expected to have significant hardware responsibility for the soft x-ray telescope, a complete, stand-alone instrument, which includes, for example, its design concepts and components, and will provide science investigations whose completion require data taken by the soft x-ray telescope. The soft x-ray telescope will provide coronal imagery that can be compared with the observations from the optical telescope. The telescope should have wide temperature coverage (for example, 0.5 MK to 10 MK), 1 arcsec resolution (defined by the pixel size) and a sensitivity, at 1 arcsec resolution, that provides a temporal resolution equivalent to that from Yohkoh (see <http://www.space.lockheed.com/SXT/homepage.html>). The capability for full Sun imaging, without rastering, is desirable but not required. The requirements can be met either by a grazing or a normal incidence telescope; no firm preference for either type of instrument has been established.

EUV Imaging Spectrometer

The U.K. will have primary responsibility for the EUV imaging spectrometer. This instrument consists of an off-axis, multilayer (Mo/Si) coated single mirror telescope and a stigmatic (imaging) spectrometer. The 4800 lines/mm grating has a focal length of 1500 mm corresponding to a plate scale of 2.1 arcsec per 15 micron, which is the expected pixel size. The dimensions of the slit correspond to 2.1 x 264 arcsec and of the slot to 264 x 264 arcsec. The spectral range will include strong lines covering a wide range of temperatures from the transition region (10^5K) to solar flare plasma (10^7K); for example, the region between 240Å to 285Å satisfies this requirement but is by no means unique.

Under the current baseline, the U.K. will build the spectrometer structure and provide its thermal design, the CCD detector system including cryostat and radiator, and all electronics associated with the spectrometer and its control. NASA is expected to have hardware responsibilities involving the basic optical system (e.g., spectrometer design concepts and components) and will provide science investigations whose completion require data taken by the EUV imaging spectrometer.

5.1.3 Description of the Spacecraft

The Solar-B spacecraft will be one of the series of scientific satellites to be launched by the Japanese M-5 rocket vehicle from the Kagoshima Space Center during the February 2004 launch window. The Solar-B spacecraft will be launched into a 600 km circular polar Sun-synchronous orbit with a 97.79 degree inclination. The orbit includes passage through the auroral zones as well as the South Atlantic anomaly and exposes the spacecraft to infrequent but intense solar particle events. Spacecraft motion projected in the solar direction, responsible for Doppler errors in radial velocity measurements, varies slowly (less than ± 0.1 mÅ/s) and over a relatively small amplitude (less than ± 100 mÅ). The primary mission phase is expected to last three years.

The Solar-B spacecraft is configured around the optical telescope contained in a cylindrical optical bench. The x-ray telescope and the EUV imaging spectrometer will be mounted to the external surface of the optical bench. The spacecraft will have the general characteristics shown in Table 5-1.

Table 5-1. Spacecraft Characteristics

Total satellite mass	875 kg
Satellite diameter	1.8 m
Satellite maximum length	3.8 m
Satellite average power	500 W
Payload total mass	310 kg
Payload average power	140 W
Total data recording capacity	3 Gbit
Telemetry rate (real time)	500 Kbps
Telemetry rate (playback)	5 Mbps
Command capability	TBD command items

The spacecraft will be 3-axis stabilized using a combination of control moment gyros, a bias momentum wheel, and magnetic torquers. Momentum adjustment devices may be employed to control torques arising from internal motions. The expected performance is shown in Table 5-2.

Table 5-2. Spacecraft Pointing Precision and Stability (Peak to Peak)

	Pitch/Yaw	Roll
Absolute Pointing	< 1 arcmin	< 2 arcmin
Short Term Stability	0.2 arcsec/s	30 arcsec/s
Long Term Stability	0.4 arcsec/min	1.5 arcmin/min

The levels of pointing stability required by the optical telescope are expected to be achieved by image motion compensation within the instrument itself. Because the optical telescope has a small field of view, the optical axis of the telescope will be offset by moving the spacecraft to acquire the field of interest, i.e., the spacecraft will not always point to Sun center. Consequently, the attached instruments must consider the effects of offset pointing on their design and operations. Further, the proposers for the x-ray instruments should realize that the pointing knowledge provided by the spacecraft is likely to be less precise than the resolution of the scientific instruments, and that the IMC will compensate for drifts in the pointing axis as well as jitter. Therefore, proposers should describe how they plan to co-align their instrument with the optical telescope and maintain the co-alignment during flight, or how they plan to obtain knowledge of the misalignment in order to co-register the resulting images to the accuracy necessary to achieve the scientific objectives.

5.1.4 Instrument Accommodation

Although the spacecraft design is still preliminary, the total resources that are estimated to be available for each of the scientific instruments are summarized in Table 5-3.

Table 5-3. Nominal Instrument Resource Allocations

Focal Plane Package (FPP; includes the two magnetographs and the IMC system).	
Mass	Approximately 80 kg (including electronics)
Length	Approximately 1 m
Location and cross section envelope	Depends on the detailed telescope-FPP interface and spacecraft design. A candidate location has the FPP mounted on the side of the telescope (rectangular box) or behind the primary mirror (rectangular or cylindrical box). FPP is directly attached to the main telescope and may or may not have a mechanical interface to the spacecraft.
Total power	<100 Watts average (including thermal control of all sensors)
Data rate	Approximately 75 % of the total available.
Soft X-Ray Telescope	
Mass	30 kg
Length	~3 m
Cross section envelope	Circular; <0.4 m diameter
Total power	20 W (including thermal control of the detector)
Data rate	Approximately one-eighth of the total available.
EUV Imaging Spectrometer	
Mass	60 kg
Length	~3 m
Cross section envelope	Rectangular <0.3 m x 0.6 m
Total power	20 W (including thermal control of the detector)
Data rate	Approximately one-eighth of the total available.

It should be noted that the above values are only guidelines; more precise values will be established for all the scientific instruments during the Phase A study period, which will then become the starting point for the final design of the entire spacecraft, including the payload, by the joint Japanese, U.S., and U.K. Solar-B science team.

5.1.5 Project Schedule

Solar-B will be launched in February 2004. To satisfy this schedule the focal plane magnetographs will be required by June 2002 for integration and testing with the optical telescope prior to integration with the spacecraft systems in February 2003. The x-ray and EUV instruments will be required in January 2003 for integration with the optical telescope prior to spacecraft integration. In addition, ISAS will require the delivery of Proto Models (engineering models) of all U.S. hardware by October 2000 to validate the mechanical, thermal, and electrical interfaces. U.S. proposals must clearly identify sufficient reserves (both schedule and financial) to ensure on-time delivery of these items. The Project Schedule as currently established is summarized in Table 5-4.

With respect to the Flight Model delivery for Electrical Interface Checks (EIC)/Mechanical Interface Checks (MIC), the Flight Models will subsequently be returned to the providers to complete their testing.

Table 5-4. Project Schedule with Milestones

Phase A	December 1998–July 1999
Phase B	July 1999-January 2000
Preliminary Design Review/ Non-Advocacy Review	December 1999
Investigators confirmed for flight	December 1999
Phase C/D	January 2000–March 2004
Proto Model delivery	October 2000
Critical Design Review	November 2000
Flight Model delivery for EIC/MIC	July 2002
Flight Model final delivery	
Focal plane instruments	June 2002
X-ray and EUV instruments	January 2003
Launch	February 2004
Phase E	March 2004–February 2007

5.2 U.S./Japan Solar-B Science Team Interface

The Solar-B mission development will follow that successfully implemented during the development of the Yohkoh payload by making use of its entire scientific team, including the selected U.S. investigators, to accomplish such tasks as preliminary mission design, operations software development, and spacecraft tracking and operations support. All Solar-B investigators, both Japanese and U.S., are expected to fully contribute to all the Solar-B efforts in this "hands-on" mode under the guidance of the Japanese Solar-B Project Manager and Project Scientist. Selected members of the U.S. Solar-B Investigation Team must be prepared to spend substantial time in Japan for these purposes. Consequently, the U.S. Investigation Team selected through this AO for the Solar-B program must be prepared to fulfill additional functions in conjunction with the implementation of their science investigations. Therefore, proposers should explicitly address their plans for fulfilling these general mission support responsibilities in their proposals.

The Solar-B data base will represent an unprecedented resource for solar physics. Its successful acquisition and interpretation will require the talents of scientists who can contribute expertise (as individuals and as part of a team) in the preparation of space experiment hardware; the operation of spacecraft; the reduction, archiving, and analysis of data; and finally, modeling and/or development and application of theory in order to understand the observed phenomena. Therefore, in addition to their individually proposed Solar-B science investigation, proposing U.S. scientists should demonstrate that they can contribute in a vital and fundamental way to the overall Solar-B project in close collaboration with the Japanese Solar-B scientists under the overall guidance of the Japanese Solar-B Project Scientist and Project Manager. Because the number of scientists on the U.S. Solar-B Investigation Team will be limited, each participant

identified in a proposal must have a clearly identified specific function that makes a demonstrable contribution to the development and/or implementation of the investigation.

In addition, while not intended to preclude in any way the day to day interactions between the Japanese and U.S. scientists participating in the individual investigations, NASA believes that a single point of contact between the Japanese Solar-B staff and the NASA-sponsored U.S. scientific teams should exist. This formal point of contact will be provided through the U.S. Solar-B Project Office at the Marshall Space Flight Center.

It has been agreed that Japanese scientists, one of whom will be the Principal Investigator for each specific investigation, will provide various subsystems of each instrument, which could include the thermal control system, some fraction of the command and data handling subsystems, and the external structure (focal plane assembly for the optical telescope only), and the optics or the detector for the x-ray telescope, in order to ensure that the interfaces of the four scientific instruments (the two magnetographs, the x-ray telescope, and the EUV Imaging Spectrometer) properly match the spacecraft. With the aid of the combined Japanese and U.S. Investigation Team, this Japanese Principal Investigator will also be responsible for experiment integration and mission operations.

For the purpose of this AO only, however, the proposals submitted by U.S. scientists should as far as possible describe the hardware and software required for a complete FPP or soft x-ray telescope or EIS optical system and show how all the subsystems interact together. Proposers must show how any proposed sensors, detectors, and on-board processing systems contribute to achieving the specific scientific objectives of this AO (Section 2.0), as well as to the overall Solar-B mission objectives (Section 5.1.1), within the expected resources of the Solar-B spacecraft.

Following selection, there will be a Phase A Concept Study (see Section 7.3) during which the interface requirements and the relationships between the Japanese and U.S. contributions to the total program will be examined in considerable detail. The instrument descriptions outlined in the proposals will be used as a starting point for these discussions.

5.3 Solar-B Data Policy

The Solar-B mission's stated goal of achieving a systems approach to the influence of the magnetic field on the solar atmosphere requires that the totality of the anticipated Solar-B data be brought to bear on the phenomena observed in a coordinated way in order that significant progress can be achieved. Therefore, it is generally understood, but not yet formally agreed, that the following principles will guide development of the final data policy:

(1) In general, the Solar-B mission data will be treated as a whole so that scientific topics may be studied to the maximum extent allowed by the totality of the available observations. Therefore, the allocation of scientific topics is expected to be made in a coordinated manner involving the entire Solar-B science team (similar to the way that Yohkoh data is currently analyzed). The U.S. Investigation Team selected through this AO should understand that their proposed research plans will be considered in this allocation of research topics. Therefore, any scientists who are part of the Japanese/U.S./U.K. Solar-B Team may be involved in the analysis of the data obtained by the U.S.-supplied instrument, and U.S. scientists who are part of the Team may, similarly, be involved in the analysis of data to be obtained from Japanese or U.K.-supplied instruments.

(2) Scientific groups responsible for the development of specific Solar-B instruments, including U.S. scientists, will have the lead role for analysis of the initial data before additional Guest Investigators are formally involved in the program. However, this policy is not intended to preclude individual U.S. scientists from requesting and receiving approval from the joint Japanese/U.S./U.K. Solar-B science team to work with Solar-B scientists, using Solar-B data. Such an agreement, however, will not entitle such individuals to financial support from the NASA Solar-B Project unless formally selected through a NASA program announcement.

(3) The participation of U.S. scientists in Japan at the technical level prior to and immediately after launch is expected to continue for some time postlaunch to expedite data analysis. For Yohkoh, such a presence has continued until the present and is expected to continue until the Yohkoh spacecraft reenters the Earth's atmosphere. A similar presence (also subject to approval for NASA extended missions operations) is expected for Solar-B with the important difference that, as a result of the restricted fields of view of at least three and possibly all four of the instruments, it is expected that the operational program will be much more objective-driven than is Yohkoh. Consequently, close coordination between the operating sequences of the four instruments will be required on a daily basis. Proposers must identify in their proposals how they plan to satisfy this requirement from the standpoint of both hardware and software, and of personnel.

(4) Solar-B is expected to provide at least ten times more data each day than Yohkoh. The extent and degree to which data from U.S. instruments may be processed in the U.S. will be negotiated during the Phase A Study period following NASA's selection of the U.S. Solar-B Investigation Teams (see Section 7.2). However, to whatever extent this is allowed, the center of operations and of the scientific analysis will remain at ISAS and the U.S. investigation teams will be expected to provide the support described in item 3 above.

(5) After some initial period (two calendar years after launch were used for Yohkoh), the Solar-B data base for the first year of operations will be made available to the international community through a NASA data center. Once the Solar-B data are deposited in an accessible data bank, it is the intention of NASA to provide support for extended data analysis through a Guest Investigator (GI) Program. NASA plans to issue the first NASA Research Announcement for the GI Program approximately 18 months after launch so that the selections will be announced at or near the time the first year of data is released.

6.0 PROPOSAL SUBMISSION AND SELECTION PROCEDURES

6.1 Preproposal Activities and Briefing

A Notice of Intent (NOI) to propose should be submitted by each prospective U.S. Principal Investigator on or before the deadline given in Section 4.0. The NOI requests information, to the extent known, on the objectives of the proposed investigation, including a description of any instrumentation likely to be proposed. The NOI should also include the names, addresses, telephone numbers, and E-mail addresses of all prospective team members and their sponsoring organizations. All material provided to NASA through an NOI is for information only and is not binding on the submitter.

A NOI to propose should be submitted by E-mail or by fax to Ms. Debra Tripp (E-mail: deb.tripp@hq.nasa.gov; fax: 202-554-3042). Do not send duplicate NOI.

Technical questions may be directed to the U.S. Program Scientist :

Dr. William J. Wagner
Research Program Management Division
Code SR
NASA Headquarters
Washington, DC 20546-0001
Telephone: 202-358-0911
E-mail: William.Wagner@hq.nasa.gov

In order to inform prospective U.S. proposers of the most current plans for Solar-B, especially concerning the resources likely to be available for the payload, there will be a Preproposal Briefing in Room MIC-6A at NASA Headquarters, starting at 9:00 a.m., Eastern Standard Time (EST) and lasting no later than 5:00 p.m., according to the schedule given in Section 4.0. All interested parties may receive further information on this meeting by contacting the U.S. Solar-B Program Scientist, listed above. The following protocol shall apply to the conduct of this briefing:

a) The Solar-B Preproposal Briefing will be chaired by the U.S. Solar-B Program Scientist and co-chaired by a Japanese Solar-B scientist, with U.K. participation.

b) Japanese Solar-B project and scientific personnel will provide a review of the Solar-B program that is as up-to-date as possible, covering such subjects as science objectives; candidate instruments for the model payload; spacecraft resources for the payload; plans for mission development, operations, and data analysis; and expected project schedule. It shall be understood by prospective U.S. proposers that, while every effort will be made to ensure that such information will be as current as possible, many of the final Solar-B specifications will not be determined until the payload instruments are actually chosen and a joint Japanese/U.S. Solar-B science team is established and functioning.

c) Following the formal briefing noted in part b) above, the Solar-B personnel will answer questions submitted by prospective U.S. proposers. Such questions must be submitted in writing to the U.S. Solar-B Program Scientist (listed above) no later than 24 hours in advance of the start of the meeting, and may cover any phase of the Solar-B program. The author(s) of such questions will not be identified at the briefing. All present at the briefing will be allowed to hear each question and its response. Only questions of clarification will be allowed in real time. The NASA chairman, the Japanese Solar-B co-chairman and the U.K. participant will have the right to rule on whether or not a question meets this guideline. Prospective U.S. proposers will not be asked any questions. In order to ensure that the information provided at this briefing is available to all prospective proposers, a video tape of questions and answers will be kept by the U.S. Solar-B Program Scientist and sent to all participants and to those submitting a NOI to propose.

6.2 Format and Content of Proposals

NASA guidance for proposals in general is given in Appendix A, which is considered binding unless specifically amended in this Section of this AO. A uniform proposal format is required

from all proposers to aid in proposal evaluation. The required proposal format and contents are summarized in Appendix B. Failure to follow this outline may result in reduced ratings during the evaluation process, or in extreme cases, could lead to rejection of the proposal without review.

6.2.1 Investigation and Technical Plan

The proposal shall be limited to a single volume plus the prefatory materials and the allowed appendices (see Appendix B). The volume should provide a clear statement of the proposed research investigation and how it will address the scientific objectives of the Solar-B mission (as outlined in Section 2.0), while maintaining consistency with the NASA resources (Section 1.2), expected model payload and spacecraft, the missions operations and data analysis plans, and the expected project schedule (Section 5.1). The proposal should contain enough background information to be meaningful to a reviewer who is generally familiar with the field, although not necessarily a specialist.

The description of proposed hardware must provide adequate technical information to permit evaluation. In addition, the proposal must specifically address how such hardware can be accommodated within the spacecraft resources and configuration advertised in this AO plus any special requirements necessary for successful implementation. This information should be given in sufficient detail to permit an evaluation of both the concept and the practical feasibility of the hardware. In addition, the proposal should describe how the data that are to be obtained with the proposed hardware are related to that to be obtained from the other instruments of the model payload. Specific approaches being proposed to maximize the effective use of these data for the study of outstanding problems in solar physics should be identified together with the proposer's plans for data processing and management.

6.2.2 Cost Plan

The Cost Plan should provide an estimate of the total cost to NASA of the investigation, along with sufficient technical information to allow the reliability of the figures to be judged. The assumptions on which the estimate is based should be stated, particularly with regard to any requested Government-furnished equipment and services. For purposes of this cost estimate, the proposer should assume delivery of any U.S. hardware in accordance with the Project Schedule shown in Table 5-4. In particular, it should be carefully noted that once the Solar-B mission-need dates are established by ISAS, they are very firm. Therefore, proposal cost estimates must include clearly identified and sufficient reserves of both schedule and financial resources to ensure on-time delivery.

The Cost Plan should have two parts: a detailed total cost for the Concept Study (Phase A) that is expected to last for seven months and an estimated cost plan for Phases B, C, D, and E. Firm, fixed-price Phase A contracts will be issued for the concept study while, in the meantime, the contract for Phase B through E is negotiated. Proposers must estimate the NASA Investigation Cost in the proposal and, if selected through this AO, in much more detail in the concept study report (See Appendix F). The specific cost information required for proposals is contained in Appendix B. Because the allocation of hardware responsibilities between ISAS and NASA and the location of the interfaces between the instruments and the spacecraft have not been finalized, proposers are asked to break down the estimates to a level that allows the total costs associated with major subsystems of the hardware to be identified.

Since cost details are not anticipated until the conclusion of the concept study, cost estimates in the proposal may be generated with models or cost estimating relationships from analogous investigations. An investigation may be descoped to meet cost restraints; therefore, the proposer shall identify a prioritized plan for the removal of science objectives. The hardware and Project costs associated with the investigation at each level of descoping should also be estimated.

6.3 Submission Information and Certifications

All proposals must have a Cover using the form that is located at the end of Appendix B. Once the form is completed, it should be used to obtain the required Principal Investigator and institutional signatures. Paper copies of proposals must be received by the indicated due date.

Proposers must provide 30 copies of their proposal, plus the original signed proposal. All proposals must be received at the following address before the proposal deadline in Section 4.0:

Solar-B Support Office
Jorge Scientific Corporation
400 Virginia Avenue SW, Suite 700
Washington, DC 20024
Telephone: 202-554-2775

Point of contact for commercial delivery: Ms. Debra Tripp at 202-554-2775. All proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals (Appendix A, Section VII).

NASA will notify the proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact Dr. William J. Wagner at the address shown in Section 6.1.

The original copy of all proposals shall include a letter of endorsement signed by an institutional official from each partner and each organization expecting to provide contributions of hardware, software, facilities etc. This official must certify institutional support and sponsorship of the investigation, as well as concurrence in the management and financial parts of the proposal. An additional certification identified in Appendix E is required and must be included with the original, signed proposal.

7.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

7.1 Evaluation Criteria and Procedures

The fundamental aim of this NASA investigation acquisition process is to identify scientific ideas and unique instrumental capabilities that best address the overall scientific objectives of the Solar-B program as described in this AO. Accordingly, the following criteria (in order of decreasing importance) will be used in evaluating all proposals submitted in response to this AO.

- The scientific and technological merit of the proposed investigation and its relevance to the specific opportunity described in this AO.

- The adequacy and heritage of any hardware proposed for the Solar-B mission, with particular regard to its ability to supply the data needed for the proposed investigation within the Solar-B spacecraft constraints of mass, volume, power, data storage, and transmission rates.

- The total NASA cost and management practices, and technical and cost risk (uncertainty) associated with the proposed investigation. Total NASA cost will be considered to include not only that proposed for any instrument development and for data analysis, but also the projected cost of the investigation during mission operations. Management aspects include the capability to deliver any proposed hardware on the schedule required by the Solar-B project.

- The competence and relevant experience of the proposing investigation team as an indication of their ability not only to carry the investigation to a successful conclusion, but also to contribute to the end-to-end Solar-B mission-related activities required by the Solar-B project, and to provide the necessary support (logistics, facilities, etc.) to ensure that the investigation can be completed satisfactorily.

All proposals submitted in response to this AO will be subjected to a preliminary screening to determine their compliance to the constraints, requirements, and guidelines of the AO. Proposals not in compliance will be returned to the proposer without review. Proposals in compliance with this AO after this preliminary assessment, but before the peer review described below, will be scrutinized for technical and fiscal integrity by NASA. The intent of these reviews will be, first, to assess the likelihood that any proposed hardware can be built using state-of-art techniques and be delivered within the mission schedule for Solar-B; and second, to independently estimate the likely cost-to-NASA for the entire investigation as proposed.

Following these preliminary reviews, the scientific and technical aspects of each proposal will be assessed by a panel of scientific and technical peers of the proposers. These panels may be augmented through the solicitation of mail-in reviews as well, which the panels have the right to accept, modify, or reject. A non-Government organization will be used by NASA to provide assistance in organizing and documenting this panel review process. The purpose of this peer evaluation will be to determine the scientific and technical merit of each proposal expressed in terms of its inherent strengths and weaknesses. Results of the earlier technical and cost reviews by NASA and technical reviews by ISAS scientists will be available to these reviewers. The proposals will not be directly intercompared by this peer review panel.

Once the panel evaluations are complete, a Panel Executive Committee, composed wholly of Civil Servants, will convene to consider the peer review results and finalize the evaluations of each criteria for each proposal. Based on these results, the Executive Committee will then serve as an Ad Hoc Subcommittee of the Space Science Steering Committee (SSSC; see further below in this Section) to categorize the proposals in accordance with procedures required by Federal Acquisition Regulations (FAR) Supplement 1870.102. These Categories are defined in Appendix C.

7.2 Selection Procedures

The results of the proposal evaluations and categorizations will then be presented by the U.S. Solar-B Program Scientist to the SSSC, which is composed wholly of NASA Civil Servants and appointed by the Associate Administrator for Space Science. The SSSC will conduct an independent review of the evaluation and categorization processes regarding both their compliance to established policies and practices as well as their completeness, self-consistency, and adequacy of all materials related thereto. After this review, the final evaluation and categorization results will be forwarded by the SSSC to the Associate Administrator who will make the final selections which are subject to the concurrence of ISAS, and of PPARC in the case of the EIS. The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize scientific return within the available budget.

It should also be noted that NASA reserves the right to select only a portion of a proposer's investigation and/or to invite his/her participation with other investigators in a joint investigation. In that case, all affected proposers will be given the opportunity to accept or decline such partial acceptance and/or participation with other investigators (See Appendix A, Section II).

Following selection, direct responsibility for establishing a contract with the institution of the Principal Investigator of the U.S. Solar-B Investigation Team will be assigned to the U.S. Solar-B Project Office at the Marshall Space Flight Center. It is expected that funding for the Phase A Studies will begin quickly thereafter. Appendix F contains details of the report that will be expected from those proposers selected through this AO.

7.3 Implementation Procedures

After selection, it is planned that the selected U.S. Science Investigation Teams will enter a Phase A (Concept Study) lasting seven months supported by a firm, fixed-price contract This Phase A contract will be based on a model contract that will become available June 15, 1998 and which must be submitted with the proposal. The model contract will be found on the NASA Solar Physics Discipline World Wide Web site at <http://umbra.nascom.nasa.gov/spd/solar_discipline.html>, on the NASA Acquisition Internet Service site at <http://sunwks.msfc.nasa.gov/solicit/procure.html>, and also will be sent to those who submit NOI. Support provided to the selected U.S. science investigators during this concept study will be to develop, in close collaboration with the Japanese Solar-B scientific and project staffs (or with equivalent UK representatives in the case of EIS), a detailed technical description of the hardware and associated interfaces to be provided by their investigations, plus detailed cost-to-NASA and schedule plans for the execution of the entire science investigation for which the U.S. scientists are selected. It should be assumed that during this phase there will be at least one progress review to be held at either NASA HQ or Marshall Space Flight Center to ensure that the projected cost of each investigation is within the cost limits established at the time of selection.

Near the end of Phase A, a Requirements Review will be held by NASA and ISAS about May 1999 to define the hardware and software functional requirements including interfaces, interface requirements, and interface concepts. The division of work among the participants and the engineering and management requirements and associated documents will be reviewed. The project requirements will be baselined upon completion of this review.

At the end of the Phase B Study, a Science Confirmation (Nonadvocacy) Review will be held by NASA, the purpose of which will be twofold: first, to assess whether the selected U.S. Solar-B investigations have achieved a detailed definition of the tasks and schedules as determined jointly with the Japanese Solar-B Project Office, thus reasonably assuring that the objectives of the U.S. investigation may be carried successfully to completion; and, second, to assess whether the selected U.S. Solar-B investigation can be carried out at a cost acceptable to NASA. Investigations selected for participation in the U.K. instrument will be expected to provide documentary evidence that the international partner with whom they are collaborating has been selected for flight.

Subject to these conditions, plus the conclusion of NASA/ISAS and NASA/PPARC agreements for participation in the Solar-B program, final confirmation for development for flight of the U.S. Solar-B investigations will be made by the NASA Associate Administrator for Space Science. At that time, it is understood that a number of the U.S. scientists will be designated as Co-Investigators on the Solar-B mission by ISAS. NASA will continue to deal with the designated Principal Investigator of the U.S. Solar-B Investigation Teams concerning all contractual matters.

NASA intends to provide the appropriate degree of management oversight needed to ensure that any hardware developed for delivery to ISAS meets reasonably acceptable standards of quality for space flight and that the costs charged to NASA for the overall U.S. investigation remain within established budgets. However, it will be largely left to the U.S. team and their Japanese counterparts to determine whether any U.S.-developed hardware meets the requirements for successful incorporation into the Solar-B payload. In order to facilitate export to Japan (or U.K. in the case of EIS), NASA expects to take final delivery of any U.S.-provided hardware for Solar-B in order to serve as the export agent to ISAS.

8.0 CONCLUSION

This Announcement of Opportunity (AO) is in direct response to an invitation from the Institute of Space and Astronautical Science (ISAS) of Japan for U.S. scientific participation in their next solar mission, called the Solar-B mission, intended to be launched in 2004. This mission represents an excellent successor to the extremely successful Yohkoh program jointly carried out by NASA and ISAS during the epoch of maximum solar activity in the early 1990's and is responsive to the recommendations NASA continues to receive from its Roadmap and Advisory Committees for a mission to study the Mechanisms of Solar Variability.

In addition, this offer from ISAS to NASA for cooperation on Solar-B represents another significant step in the growth of scientific cooperation between the U.S. and Japan. This cooperative program will be conducted under the U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology that has been agreed to between the two governments. NASA is pleased to be able to offer its support for this ISAS program and hereby invites the U.S. science community to propose investigations as outlined in this AO.

George L. Withbroe
Science Program Director
The Sun-Earth Connection

Wesley T. Huntress, Jr.
Associate Administrator for
Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use, by the selected investigator, of Government instrumentation or property that becomes available, with or without modification, that will meet the investigative objectives.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this AO, NASA will award prime contracts to non-Government participants, including Co-Investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Refer to Section G of Appendix B of this AO for proposal information which the selecting official will review in determining whether to incorporate a non-Government participant in the selection decision. Each NASA contract with hardware fabricators or service providers selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. The investigator should also understand that NASA may desire to select only a portion of the proposed investigation and/or that NASA may desire the individual's participation with other investigators in a joint investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its team leader or contact point.

III. SELECTION WITHOUT DISCUSSION

The Government reserves the right to reject any or all proposals received in response to this AO when such action shall be considered in the best interest of the Government. Notice is also given of the possibility that any selection may be made without discussion (other than discussions conducted for the purpose of minor clarification). It is therefore emphasized that all proposals should be submitted initially on the most favorable terms that the offeror can submit.

IV. (RESERVED)

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. Information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice. To prevent inadvertant disclosure, proposal data shall not be included in submissions (e.g. final reports) that are rountinely released to the public.

RESTRICTION ON USE AND
DISCLOSURE OF
PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

The investigator's institution agrees that the cost proposal is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit cost information in accordance with FAR 15.8.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated, should such action be in the interest of the Government.

VIII. (RESERVED)

IX. DISCLOSURE OF PROPOSALS OUTSIDE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator

or institution desire to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

By submitting a proposal, the investigator and institution agree to accept the following clause in any resulting contract:

EQUAL OPPORTUNITY

During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(b) The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

(c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(e) The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding the notice to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(h) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the

purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(I) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(j) The Contractor shall include the terms and conditions of subparagraph l through 9 of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(k) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing these terms and conditions, including sanctions for non-compliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

XI. PATENT RIGHTS

(a) For any contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at 1852.227-70, New Technology, shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at 1852.227-71, Requests for Waiver of Rights to Inventions.

(b) For any contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form) (as modified by 1852.227-11), shall apply.

XII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

(a) Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities, and minority educational institutions, as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. For this Announcement of Opportunity, NASA has established a recommended goal of 8 percent for the participation of these entities at the prime and subcontract level. This goal is stated as a percentage of the total contract value. NASA encourages all offerors to meet or exceed this goal to the maximum extent practicable and to encourage the development of minority businesses and institutions throughout the contract period. Offerors will be evaluated on the proposed goal for participation of the entities listed above in comparison with the 8 percent goal and on the methods for achieving the proposed goal.

(b) Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed $500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors who are selected under this AO will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, and women-owned small business concerns. Note that these specific subcontracting goals differ from the 8 percent goal described in paragraph A above, and need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after selection shall make the offeror ineligible for award of a contract.

APPENDIX B

SPECIFIC GUIDELINES FOR PROPOSAL PREPARATION IN RESPONSE TO THIS AO

The following guidelines apply to the preparation of proposals by potential investigators in response to this Solar-B Investigation Announcement of Opportunity (AO). The material presented is a guide for the prospective proposer, and is not intended to be all encompassing. The proposer should, however, provide information relative to those items applicable or as otherwise required by the Announcement of Opportunity. In the event of an apparent conflict between the guidelines in this Appendix and those contained with the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use the metric system of units, and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, floppy disk, etc., is not acceptable. In evaluating proposals, NASA will only consider printed material. No proposal may reference a World Wide Web site for any data needed to understand or complete the proposal.

The proposal must consist of only one volume, with readily identified sections corresponding to sections A through H given below. Proposals shall adhere to the page limits in Table B-1, including no more than two fold-out pages (28 x 43 cm; i.e., 11 x 17 inches) that count as one page each. All pages other than fold-out pages shall be 8.5 x 11 inches. The cover, table of contents, and appendices will not be counted against the page limit; for the remainder, every side upon which printing appears will be counted against the page limits.

Single- or double-column format is acceptable. In complying with the page limit, no page shall contain more than 55 lines of text and the type font shall not be smaller than 12-point Times (i.e., approximately 15 characters per inch).

Table B-1. Proposal Page Guideline

Section	Page Limits
Cover	2
Table of Contents	1
Science Investigation Description	20
Education/Public Outreach,	5
Technology, and Small, Disadvantaged Business Plan	2
Mission Operations Support and Data Analysis Plan	4
Management, Schedule, Cost Estimating Methodology, and Phase A Costs	6
Appendices (No others permitted) Phase A Contract (from model provided) Resumes (2 pages maximum each) Letter(s) of endorsement from participating institution(s) Statement of Work References Description of Team Member Selection (NASA PI's only)	No page limit but small size encouraged

In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy (including cover, certifications, and non-U.S. endorsements) should be bound in a manner that makes it easy to disassemble for reproduction. Except for the original, two-sided copies are preferred.

The content of each proposal shall be as follows:

A. COVER

A cover, which shall be two pages in length, must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. The full names of the Principal Investigator and the authorizing official,

their addresses with zip code, telephone and fax numbers, and electronic mail addresses, shall be included. The form to be used for this Cover is located at the end of this Appendix.

B. TABLE OF CONTENTS

The proposal should contain a one page Table of Contents. This Table of Contents should parallel the outlines provided below in Sections C through G.

C. SCIENCE INVESTIGATION

The science section should describe the scientific objectives of the proposed investigation, including the value of the investigation to the Solar-B mission objectives. A discussion of the scientific products and how the science products and data obtained will be used to fulfill the scientific objectives should be provided. A discussion of how the science data will be obtained, including a plan for delivery of the products, and the individuals responsible for the data delivery, should also be provided.

1. Scientific Goals and Objectives. This section should consist of a discussion of the goals and objectives of the investigation, their value to NASA's Sun-Earth Connection Scientific Theme and to the specific Solar-B objectives described in this AO, and their relationships to past, current, and future investigations and missions. It should describe the history and basis for the proposal and discuss the need for such an investigation.

   The measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation should be discussed. This description should identify the investigation to be performed, the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (bits, images, etc.). The data downlink is likely to be limited and has to support all the instruments, consequently, proposers should justify their telemetry requirements in terms of the overall mission objectives. The relationship between the data products generated and the scientific objectives should be explicitly described. The improvement over current knowledge that the results of the investigation are expected to provide should be clearly stated.

2. Science Implementation.

   a. Instrumentation. This section should describe the instrumentation and the criteria used for its selection. It should identify the individual components and instrument systems, including their characteristics and requirements. In particular, it should describe all parameters of the instrument that are pertinent to the accommodation of the instrument into the spacecraft. These include but are not limited to: volumetric envelope, mass, power and thermal requirements; telemetry and command requirements; sensitivity to contamination; pointing requirements and on-board data processing. It should indicate items that are proposed to be developed, as well as any existing instrumentation or design/flight heritage.

A preliminary description of the instrument design with a block diagram showing the instrument systems and their interfaces should be included. Since the locations of the interfaces are not finalized, proposers should identify possible locations for the electrical, mechanical, and data interfaces. Where more than one choice is available, they should identify and justify their preference. A description of the estimated performance of the instrument must be included and the performance characteristics should be related to the measurement and investigation objectives as stated in the proposal. Such characteristics include a discussion of the data rates, fields of view, resolution, sensitivity, pointing accuracy, etc.

b. Mission. The observing strategy, within the framework of the expected spacecraft performance, required for obtaining the necessary data with the proposed instrumentation must be described. Operational constraints, viewing, and pointing requirements should be identified. The concept and the expected requirements for supporting mission operations must be given. Requirements for pre- or postlaunch ground operations support should be identified.

c. Data Analysis and Archiving. The data reduction and analysis plan, after the data have been delivered to the ground, should be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving should be discussed, including a list of the specific data products and the individual team members responsible for the data products. The plan must include a detailed schedule for the submission of raw and reduced data to the appropriate data archive in the proper formats, media, etc. Delivery of the data to the data archive must take place in the shortest time possible consistent with the joint ISAS/NASA policy on data access.

d. Science Team. This section must identify the investigation science team. The roles and responsibilities of each science team member in the investigation must be explicitly defined.

D. EDUCATION, OUTREACH, TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The Education/Public Outreach, technology, and small disadvantaged business section shall provide a summary of the benefits offered by the mission beyond the scientific benefits. This plan should reflect the proposer's commitment to achieving the goals of the OSS education and outreach strategy as reflected in the Implementation Plan for that strategy, the use of new technology in the implementation of the investigations, and participation of small disadvantaged business. Further information on the OSS' broad approach to Education/Public Outreach can be found in Appendix G. Guidance on the use of new technology in investigations can be found in the OSS Integrated Technology Strategy. These documents can be accessed on line at: <http://nic.nasa.gov/oss/>.

E. MANAGEMENT AND SCHEDULE

This section should briefly summarize the investigator's proposed management approach. The management organization and decision-making process should be described and the teaming arrangement (as known) should be discussed. The responsibilities of team members, including contributors, and institutional commitments should be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience with similar systems and equipment, should be addressed. The specific roles and responsibilities of the Principal Investigator, Co-Investigators, and Project Manager should be discussed. Key project personnel (e.g., the Project Manager) need not be identified by name at this time.

A project schedule to meet the proposed launch date and covering all phases of the investigation should be provided. The schedule should include proposed major project review dates, instrument development, spacecraft development, instrument to spacecraft integration and test, launch vehicle integration, and mission operations and data analysis.

F. COST AND COST ESTIMATING METHODOLOGY

This section shall include a first-order estimated cost of the investigation that encompasses all proposed activities, including Phase A/B/C/D/E, launch services, development of the ground data system, fee, and contributions. These costs shall be consistent with the program requirements described in Section 5 of the AO. The amount to be costed in each fiscal year should be identified by providing the data in Table B-2, which will not be counted against the page limit, using the WBS elements identified in Table B-3. Table B-4 gives the NASA inflation index to be used to calculate real year dollars.

The methodology used to estimate the cost, for example, engineering estimate, specific cost model, past performance, cost estimating relationships from analogous missions, should be discussed.

1. Full Cost Accounting

NASA civil service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission or for completion of the definition studies, NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, “Cost Principles for Reimbursable Agreements,” or based on their own Center-approved full cost accounting models. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

G. APPENDICES

The following additional information is required to be supplied with the proposal. This information can be included as Appendices to the proposal, and, as such, will not be counted within the specified page limit. NO OTHER APPENDICES ARE PERMITTED.

1. Phase A Contract. Provide a Phase A contract based on the model made available.

2. Resumes. Provide resumes or curriculum vitae for all science team members identified in the science section. Resumes or curriculum vitae should be no longer than two pages in length each.

3. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering to make a contribution to the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

4. Statement of Work (SOW). For investigations managed from non-Government institutions, provide a SOW for all potential contracts with NASA. For investigations managed from Government institutions, provide a SOW as if the institution were non-Government. This SOW must include the requirement for a concept study report as defined in Appendix F. In addition, the SOW must include general tasks statements for Phases B/C/D, and for Phase E for the investigation. All SOW's should include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). SOW's need not be no more than a few pages in length.

5. References List: Proposals may provide a list of reference documents and materials cited in the proposal. The documents and materials themselves cannot be submitted except as a part of the proposal (i.e., within the page limits).

6. NASA Principal Investigator Proposing Teams: Proposals submitted by NASA employees as Principal Investigators should contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and

has determined that no personal conflict of interest exists. The proposal provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

Table B-2. Total Investigation Cost Funding Profile Template
(FY costs in Real Year Dollars, Totals in Real Year and FY 1998 Dollars)

Item	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05 –07	Total (Real Year)	Total (FY 1998)
Phase A										
Phase B/C/D										
WBS1.0										
WBS2.0										
WBS3.0										
WBS4.0										
WBS5.0										
WBS6.0										
WBS7.0										
WBS8.0										
WBS9.0										
Phase E										

(1) Costs should include all costs including overhead, G&A and fee.
(2) Phase E costs are estimates for planning purposes only.

Table B-3. WBS Elements

1. Management/Science Support including Co-Investigators
2. Optical System
3. Structure and Mechanisms
4. Sensors/Camera
5. Power Distribution
6. Data processing Electronics
7. Software Development/Hardware Associated: Flight and Ground Test
8. Software Development/Data Processing
9. Integration and Test

Where appropriate the WBS element contains, design, development, fabrication and testing.

Table B-4. NASA New Start Inflation Index

Fiscal Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Inflation Rate		3.9%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Cumulative Inflation Index	1.000	1.039	1.078	1.119	1.162	1.206	1.252	1.300	1.349	1.400

AO 98-OSS-05	Solar-B	
Principal Investigator *Title* *First Name* *Middle Name* *Last Name*		
Department		
Company/Institution		
Street Address	City/Town	
State	Zip/Postal	Country
Telephone	Fax	E-Mail Address
Principal Investigator's Signature		Date

Proposal Title
Abstract (Limit 200 words)

Institutional Endorsement

Name of Authorizing Official	
Title	
Address	
Signature	Date

Principal Investigator			
Title	*First Name*	*Middle Name*	*Last Name*
Proposal Title			

Cost
NASA Investigation Cost $_____

Instrument Type:

Co-Investigator(s)		
Name	Institution	E-mail

APPENDIX C

GLOSSARY OF TERMS AND ABBREVIATIONS ASSOCIATED WITH INVESTIGATIONS

Advisory Committee Subcommittee--Any committee, board, commission, council, conference, panel, task force; or other similar group, or any subcommittee or other subgroup thereof, that is not wholly composed of full-time Federal Government employees, and that is established or utilized by NASA in the interest of obtaining advice or recommendations.

Announcement of Opportunity (AO)--A document used to announce opportunities to participate in NASA programs.

AO Process--A term used to describe the program planning and acquisition procedure used to acquire investigative effort, initiated by an AO.

Categorization--The process whereby proposed investigations are classified into four categories: synopsized here as Category I--recommended for immediate acceptance; Category II--recommended for acceptance but at a lower priority than Category I proposals; Category III--sound investigations requiring further development; Category IV--rejected.

Co-Investigator (Co-I)--Associate of a Principal Investigator, responsible to the Principal Investigator for discrete portions or tasks of the investigation. A NASA employee can participate as a Co-I on an investigation proposed by a private organization.

Data Users--Participants in NASA programs, selected to perform investigations utilizing data from NASA payloads or facilities.

Experiments--Activities or effort aimed at the generation of data. NASA-sponsored experiments generally concern generation of data obtained through measurement of aeronautical and space phenomena or use of space to observe earth phenomena.

Federal Acquisition Regulation (FAR)--The regulations governing the conduct of acquisition.

Flight--That portion of the mission encompassing the period from launch to landing or launch to termination of the active life of spacecraft. The term shuttle "flight" means a single shuttle round trip--its launch, orbital activity, and return; one flight might deliver more than one payload. More than one flight might be required to accomplish one mission.

Flight Investigation--Investigation conducted utilizing aeronautical or space instrumentation.

Flight Opportunity--A flight mission designed to accommodate one or more experiments or investigations.

Guest Investigators--Investigators selected to conduct observations and obtain data within the capability of a NASA mission, which are additional to the mission's primary objectives. Sometimes referred to as Guest Observers.

Investigation--Used interchangeably with "Experiments."

Investigation Team--A group of investigators collaborating on a single investigation.

Investigator--A participant in an investigation. May refer to the Principal Investigator, Co-Investigator, or member of an investigation team.

Mission--The performance of a coherent set of investigations or operations in space to achieve program goals. (Example: Measure detailed structure of Sun's chromosphere; survey mineral resources of North America.)

NASA FAR Supplement--Acquisition regulations promulgated by NASA in addition to the FAR.

NMI--NASA Management Instruction.

Notice of Intent--A notice or letter submitted by a potential investigator indicating the intent to submit a proposal in response to an AO.

Payload--A specific complement of instruments, space equipment, and support hardware carried to space to accomplish a mission or discrete activity in space.

Peer Group--A gathering of experts in related disciplinary areas convened as a subcommittee of the Program Office Steering Committee to review proposals for flight investigations.

Peer Review--The process of proposal review utilizing a group of peers in accordance with the categorization criteria as outlined in this AO.

Principal Investigator (PI)--A person who conceives an investigation and is responsible for carrying it out and reporting its results. A NASA employee can participate as a PI only on a government-proposed investigation.

Program--An activity involving human resources, materials, funding, and scheduling necessary to achieve desired goals.

Project--Within a program, an undertaking with a scheduled beginning and ending, which normally involves the design, construction, and operation of one or more aeronautical or space vehicles and necessary ground support in order to accomplish a scientific or technical objective.

Project Office--An office generally established at a NASA field installation to manage a project.

Selection Official--The NASA official designated to determine the source for award of a contract or grant.

Space Facility--An instrument or series of instruments in space provided by NASA to satisfy a general objective or need.

Steering Committee--A standing NASA sponsored committee providing advice to the Program Associate Administrators and providing procedural review over the investigation selection process. Composed wholly of full-time Federal Government employees.

Study Office--An office established at a NASA field installation to manage a potential undertaking which has not yet developed into project status.

Subcommittee--An arm of the Program Office Steering Committee consisting of experts in relevant disciplines to review and categorize proposals for investigations submitted in response to an AO.

Supporting Research and Technology (SR&T)---The programs devoted to the conduct of research and development necessary to support and sustain NASA programs.

Team--A group of investigators responsible for carrying out and reporting the results of an investigation or group of investigations.

Team Leader--The person appointed to manage and be the point of contact for the team and who is responsible for assigning respective roles and privileges to the team members and reporting the results of the investigation.

Team Member--A person appointed to a team who is an associate of the other members of the team and is responsible to the team leader for assigned tasks or portions of the investigation.

APPENDIX D

BIBLIOGRAPHY OF RELEVANT REPORTS AND RECOMMENDATIONS

I. SUMMARY OF FORMAL PUBLISHED REPORTS

All of the following reports have been issued by the National Academy of Sciences since 1980 through the auspices of its Space Science Board (SSB), the SSB Committee on Solar and Space Physics (CSSP), the Committee on Solar-Terrestrial Research (CSTR) of the Board on Atmospheric Sciences and Climate, or one of several ad hoc panels (in particular, the Astronomy Survey Committee of 1982 and 1991, the Panel on the Physics of the Sun in 1985, and through NASA's Sun-Earth Connection Advisory Subcommittee (SECAS) and the Space Science Advisory Committee (SSAC)). The page numbers shown are those for which recommendations for and/or discussion of the value of the study of solar processes and the magnetic field are given.

1980: Solar-System Space Physics in the 1980's/A Research Strategy (pp. 7–9; 22, 23; 45–49)

1981: Solar-Terrestrial Research for the 1980's (pp. ii-13; 26–27; 43; 47–48; 70–76; 134)

1982: Astronomy and Astrophysics for the 1980's/Volume I: Report of the Astronomy Survey Committee (pp. 76–80)

1984: National Solar-Terrestrial Research Program (pp. 11–12, 25)

1985: The Physics of the Sun (pp. 14–15; 20–22; 44–46; 61–62)

1990: Office of Space Science and Applications Strategic Plan (pp. 11, 29, 34, 57)

1991: The Decade of Discovery in Astronomy and Astrophysics/Volume 11: Astronomy and Astrophysics Panel Reports (pp. ix-3, ix-5–11, ix-21–22)

1991: Space Physics Strategy – Implementation Study – The NASA Space Physics Program for 1995–2010 (pp. 10–11, 68, 70, 75, 139–140)

1997: Sun-Earth Connection Roadmap: Strategic Planning for the Years 2000–2020 (pp.19, 25–31, 90–91)

II. EDUCATION OUTREACH

Documentation on Education/Public Outreach and other relevant subjects can be found on-line at the "Education and Public Outreach" OSS home page at <http://www.hq.nasa.gov/office/oss/>.

"OSS Integrated Technology Strategy" (April 1994).
Describes efforts to manage technology infusion into future OSS missions and to promote technology transfer to the private sector.

"Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs" (March 1995).

This document describes the overall strategy for integrating education and public outreach into NASA's space science programs.

"Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy" (October 1996)

This document describes OSS's overall approach to implementing its Education/Public Outreach strategy.

NHB 7120.5 – Management of Major System Programs and Projects (November 1993)
This NASA Handbook provides a reference for typical activities, milestones, and products in the development and execution of NASA missions.

APPENDIX E
CERTIFICATION

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS PRIMARY COVERED TRANSACTIONS

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1265.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Institution Principal Investigator

Name and Title of Authorized Representative

Signature Date

APPENDIX F

GUIDELINES FOR PHASE A (CONCEPT STUDY) REPORT

This appendix is intended to provide guidelines to investigations selected under this AO for the preparation of a concept study report. This report is to be prepared by each selected investigation team during their Phase A concept study. It is due at the completion of the concept study and will be used by NASA to determine if the investigation is ready to proceed into subsequent mission phases. These guidelines may be updated at notification of selection.

The concept study report should contain the following: (i) executive summary; (ii) science investigation description; (iii) technical approach; (iv) management plan; (v) education and outreach, technology, and small disadvantaged business plan; (vi) Phase B/C/D plan; (vii) cost plan; and (viii) appendices. Any changes to the basic data provided in the original proposal should be clearly identified in the concept study report.

The concept study report shall contain no more than 123 pages, including no more than 4 fold out pages (28 x 43 cm; i.e., 11 x 17 inches). The cover, table of contents, and appendices will not be counted against the page limit. The applicable page limits applying to individual sections are given in Table F-1.

Table F-1. Concept Study Page Limits

Section	Page Limit
Executive Summary	3 pages
Science Investigation description (changes only from proposal)	20 pages
Technical Approach Management Plan Education/Public Outreach, Technology, and Small Disadvantaged Business Plan Phase B/C/D Plan Cost Plan	100 pages
Appendices (no others permitted) Resumes Letters of Endorsement Mission Definition and Requirements Agreement Statement(s) of Work for Each Contract Option Incentive Plan(s) Relevant Experience and Past Performance International Agreement(s) Reference List	No page limit, but small size encouraged

The content of the concept study report is defined below.

A. COVER

The same guidelines as for the proposal apply. The form to be used for this Cover is located at the end of Appendix B.

B. TABLE OF CONTENTS

The same guidelines as for the proposal apply.

C. EXECUTIVE SUMMARY

The executive summary should provide an overview of the investigation, including the science objectives and their relationship to NASA's Sun-Earth Connection Science Theme and the specific Solar-B science objectives described in this AO, technical approach, including any new technology planned, management, cost, and education and outreach approaches. This section should not exceed three (3) pages.

D. SCIENCE INVESTIGATION DESCRIPTION

This section should describe any science investigation changes resulting from the Concept Study. Any changes to the investigation from the original proposal should be discussed, as should the rationale for such changes.

E. EDUCATION/PUBLIC OUTREACH, TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education and public outreach, technology, and small disadvantaged business plan should provide a summary of the benefits offered by the mission beyond the scientific benefits.

1. Education/Public Outreach Activities. This section should discuss the degree to which this investigation will generate educational opportunities while contributing to the Nation's educational initiatives. It should also describe the degree to which the scientific investigation and discoveries will be communicated to the public. Guidance is available in Appendix G.

2. New Technology. This section should discuss how new technology is used in the proposed investigation and its benefits.

3. Small Disadvantaged Business. A summary plan is required specifying the proposed investigations commitment to meet the small disadvantaged business participation goal of 8%. Refer to Appendix A for information on subcontracting plans.

F. TECHNICAL APPROACH

The Technical Approach section should detail the method and procedures for investigation definition, design, development, integration, ground operations, and flight operations. A discussion of all new technologies to be used for the investigation, including back-up plans for those technologies, should be provided. This section should also detail the expected products and end items associated with each phase. Investigation teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated. The benefits of such processes and products should be discussed. This section must be complete in itself without the need to request additional data.

Anticipating payload integration, a section should characterize the interface between the instruments and the flight system. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluents, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system. The testing strategy of the science payload, prior to integration with the spacecraft, should be discussed.

A section should describe the manufacturing strategy to produce, integrate, and test the hardware/software necessary to accomplish the mission. It should include a description of the main processes/procedures planned in the fabrication of flight hardware, software, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program. Describe the approach for the transition from design to manufacturing and specify data products which will be used to assure producibility and adequate tooling availability.

The approach, techniques, and facilities planned for integration, test, and verification, and launch operations phases, consistent with the proposed schedule and cost, should be described. A preliminary schedule for manufacturing, integration, and test activities should be included. A description of the planned end items, including engineering and qualification hardware, should be included.

The mission operations and the ground operations support required for the proposed investigation should be discussed in a section which also covers the planned approach for managing mission operations and all flight operations support, including mission planning. Describe any special communications, computer security, tracking, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel. Specific features incorporated into the flight and ground system design that lead to low-cost operation should be identified. The use of any existing mission operations facilities and processes should be described, as well as any new facilities required to meet mission objectives.

A description should be provided of any new, or modifications to existing, facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's

proposed contractors and those of NASA and other U.S. Government agencies) required to execute the investigation. The outline of new facilities and equipment should also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities. If use is to be made of facilities, laboratory equipment or GSE belonging to NASA or other U.S. Governmental agencies, a letter agreeing to this use must be provided from the appropriate agency.

A section should describe the process by which the product quality is assured to meet the customer's specifications, including identification of trade studies, the parts selection strategy, and the plans to incorporate new technology. This section should also describe the product assurance plan, including plans for problem/failure reporting, inspections, quality control, parts selection and control, safety assurance, and software validation.

G. MANAGEMENT PLAN

This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section should specifically discuss the decision-making process to be used by the team, focusing particularly on the roles of the Principal Investigator and Project Manager in that process. The management plan gives insight into the organizations proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members, and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged; however, they should be employed only when cost, schedule, or technical improvements can be demonstrated and specific enabling assumptions are identified.

1. Team Member Responsibilities. This section should describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the responsibilities assigned to the Principal Investigator, the Project Manager, and other key personnel. In addition, information should be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the Principal Investigator and science team members does not need to be included in this section since it would have been addressed in the proposal.)

    a. Organizational Structure. The management organizational structure of the investigation team must be described in the proposal. The Concept Report must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs, should be included. The contractual and financial relationships between team partners should be discussed.

If experience for a partner is not equivalent to, or better than, the requirements for the proposed mission, explain how confidence can be gained that the mission can be accomplished within cost and schedule constraints.

b. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results. Include changes in scope during development, if appropriate.

i. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator should be discussed. Provide a reference point of contact, including address and phone number.

ii. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager should be discussed. Provide a reference point of contact, including address and phone number.

iii. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation should be described.

2. Management Processes and Plans. This section should describe the management processes and plans necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section should also describe the proposed methods of hardware and software acquisition. The management processes which the investigator team proposes, including the relationship between organizations and key personnel should be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion should include all phases of the mission, including preliminary analysis, technical definition, the design and development, and operations phases, along with the expected products and results from each phase. Unique tools, processes, or methods which will be used by the investigation team should be clearly identified and their benefits discussed. All project elements should be covered to assure a clear understanding of project-wide implementation.

3. Schedules. The schedule and work flow for the complete mission life-cycle should be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase D) should be clearly identified.

4. Risk Management. This section should describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Particular emphasis should be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints.

Investigations dependent on new technology will not be penalized for risk if adequate backup plans are described to ensure success of the investigation.

A summary of margins and reserves in cost and schedule should be identified by Phase and project element and year and the rationale for them discussed. The specific means by which integrated costs, schedule, and technical performance will be tracked and managed should be defined. Specific reserves and the timing of their application should be described. Management of the reserves and margins, including who in the management organization manages the reserves and when and how the reserves are released, should be discussed. This should include the strategy for maintaining reserves as a function of cost-to-completion. All funded schedule margins should be identified. The relationship between the use of such reserves, margins, potential descope options, and their effect on cost, schedule, and performance should be fully discussed.

5. Government Furnished Property, Services, Facilities, etc. This section should clearly delineate the Government-furnished property, services, facilities, etc. required to accomplish all phases of the mission.

6. Reporting and Reviews. This section should clearly describe the approach to reporting progress to the Government and the reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance should be discussed. A description of the information to be presented should be included.

H. DEFINITION, DESIGN, AND DEVELOPMENT (PHASE B/C/D) PLAN

This section should describe the means by which the definition study and the design and development phases will be performed. This section should identify the key mission tradeoffs and options to be investigated during the Phase B studies and should identify those issues and technologies critical to the mission success. These plans should also define the products of each phase and the schedule for their delivery.

I. COST PLAN

The cost plan should provide information on the anticipated costs for all phases of the mission. A detailed cost proposal is required, including a completed SF 1411, for Phase B/C/D. Cost estimates are required for Phase E, including a description of the estimating technique used to develop the cost estimates. A discussion of the basis of the estimate should be provided with a discussion of heritage and commonality with other programs. All costs, including all contributions made to the investigation, should be included. Proposers should complete a summary of total investigation cost phased by fiscal year as shown in Table F-2. In addition, for each phase for the investigation (B/C/D, and E) a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in Table F-3, should be completed.

It is anticipated that during the period of performance of the proposed investigation, NASA will implement full cost accounting for NASA Centers or other Government laboratories. To plan for this, proposers should include any contributions provided by NASA Centers, including Civil Servant services, as well as the cost for the use of Government facilities and

equipment. All direct and indirect costs associated with the work performed at NASA Centers should be fully costed and accounted for in the proposal. Teams with NASA partners should work with their respective NASA Centers to develop estimates for these costs.

The inflation index provided in Appendix B should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used should be documented.

All costs shall include all burdens and profit/fee in real-year dollars by fiscal year, assuming the inflation rates used by NASA (provided in Appendix B) or specifically identified industry forward pricing rates.

1. Definition, Design, and Development (Phase B/C/D) Cost Proposal. This section provides a detailed cost proposal for performing Phase B/C/D. The cost proposal should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal

    a. Contract Pricing Proposal Cover Sheet. A completed Contract Pricing Proposal Cover Sheet, SF 1411, must be included with the proposal for Phase B/C/D. The SF 1411 must be signed by the proposer's authorized representative.

    b. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for Phase B/C/D. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work provided as an Appendix to the proposal. The WBS shall be described to the subsystem level for the investigation. All other elements of the WBS should be to the major task level (e.g., Project Management, Systems Engineering, Ground Support Equipment).

    c. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by month. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

    d. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase B/C/D cost proposal. Provide a description of the cost-estimating model(s) and techniques used in the Phase B/C/D cost estimate. Discuss the heritage of the models and/or techniques applied to this estimate, including any known differences between investigations contained in the model's data base and key attributes of the proposed investigation. Include the assumptions used as the basis for the Phase B/C/D cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

e. Phase B/C/D Time-Phased Cost Summary. Provide a summary of the total Phase B/C/D costs consistent with Table F-3. The Phase B/C/D cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA along with all contributed costs. The Phase B/C/D time phased cost summary should be phased by month.

f. Cost Elements Breakdown. To effectively evaluate the Phase B/C/D cost proposals, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal will include, but is not limited to:

i. Direct Labor.
   (1) Explain the basis of labor-hour estimates for each of the labor classifications.
   (2) State the number of productive work-hours per month.
   (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.
   (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
   (5) If Civil Servant labor is to be used in support of the Phase B/C/D study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic partners. A discussion of the source of funding for the Civil Servant contributions must be provided.

ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.

iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts.

iv. Other Direct Costs.
   (1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.
   (2) Computer. Provide a summary of all unique computer-related costs.
   (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
   (4) Other. Explain and support any other direct costs included in the Phase B/C/D proposal in a manner similar to that described above.

v. Indirect Costs.
   (1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
   (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.
   (3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
   (4) Discuss the fee arrangements for the major team partners.

2. Mission Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the Mission Operations and Data Analysis Phase (Phase E) portion of the mission. The Phase E cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal. In completing this section, the following guidelines will apply:

   a. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for the Mission Operations and Data Analysis Phase of the mission. The WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work that is provided as an Appendix.

   b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase E cost estimate. Provide a description of the cost-estimating model(s) and techniques used in your Phase E cost estimate. Discuss the heritage of the models applied to this estimate, including any known differences between investigations contained in the model's data base and key attributes of the proposed investigation. Include the assumptions used as the basis for the Phase E cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches, and the basis for these discounts. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

   c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

   d. Phase E Time-Phased Cost Summary. Provide a summary of the total Phase E costs consistent with Table F-3. The Phase E cost summary should be developed

consistent with the Work Breakdown Structure and should include all costs to NASA, along with all contributed costs. The Phase E time phased cost summary should be phased by fiscal year.

3. Total NASA Investigation Cost (TIC) Estimate. This section should summarize the estimated costs to be incurred in Phases A through E, including ground segment costs and cost of activities associated for social or educational benefits (if not incorporated in any of Phases A through E). The total investigation cost estimate should be developed consistent with the Work Breakdown Structure.

   This section should include:

   Detailed plans for all aspects of the mission not discussed elsewhere in the proposal, including ground segment and activities associated with social or educational benefits. Reference may be made to the Technical Approach section of the proposal. In completing this section, the following guidelines will apply:

   a. Total NASA Investigation Cost. A summary of the Total NASA Investigation Cost time-phased by fiscal year must be included in the format shown in Table F-2. This summary should represent the optimum funding profile for the investigation. Assets provided as contributions by partners should be included, and clearly identified, as separate line items.

Table F-2. Total NASA Investigation Cost Funding Profile Template
(FY costs* in Real Year Dollars, Totals in Real Year and FY 1998 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	•••	FYn	Total (Real Yr.)	Total (FY 1998)
Phase A	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase B/C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Phase E									
- Organization A									
Launch services	$	$	$	$	$	$	$	$	$
- Organization A									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
- Organization A									
Other (specify)	$	$	$	$	$	$	$	$	$
Total NASA Investigation Cost	$	$	$	$	$	$	$	$	$

Contributions by U.S. Organization to:									
Phase A	$	$	$	$	$	$	$	$	$
- Organization A									
Phase B/C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Phase E									
- Organization A									
Launch Services	$	$	$	$	$	$	$	$	$
- Organization A									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
- Organization A									
Other	$	$	$	$	$	$	$	$	$
Contributed Costs (Total)	$	$	$	$	$	$	$	$	$
						Investigation Totals			$

* Costs should include all costs including fee

Table F-3. Time-Phased Cost Breakdown
(Phased costs in Real Year Dollars, Totals in Real Year Dollars)

TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY					
WBS/Cost Category Description	Month 1 or FY1	Month 2 or FY2	•••	Month n or FYn	Total (RY$)
Total Direct Labor Cost	$	$	$	$	$
WBS 1.0 Management					
WBS 2.0 System Engineering					
WBS 2.1 Structures & Mechanisms					
WBS 2.2 Electronics					
etc.					
Total Subcontract Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Materials & Equipment Cost	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Reserves	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Other Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Fee					
Other (Specify)					
Total Contract Cost	$	$	$	$	$
Total Other Costs to NASA	$	$	$	$	$
Ground Segment					
Educational Activities					

Other (Specify)					

Total U.S. Contributions	$	$	$	$	$
Organization A:					
WBS # and Description					
etc.					
Organization B:					
WBS # and Description					
etc.					

TOTAL COST FOR PHASE	$	$	$	$	$

J. APPENDICES

The following additional information is required to be supplied with the concept study report. This information can be included as appendices to the report, and as such, will not be counted within the specified page limit.

1. Resumes. Provide resumes for all key personnel identified in the Management section.

2. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering to make a contribution to the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

3. Statements of Work for Each Contract Option. Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work should (as a minimum) be for each contract option (i.e., Phase B/C/D, and Phase E) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.

4. Relevant Experience and Past Performance. Relevant experience and past performance (successes and failures) of the major team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed. A description of each project, its relevance to the proposed investigation, cost and schedule performance, and points of contact (including addresses and phone numbers), should be provided.

5. Reference List. Proposals may provide, as an appendix, a list of reference documents and materials used in the proposal. The documents and materials themselves cannot be submitted.

APPENDIX G

EDUCATION AND PUBLIC OUTREACH

I. SCOPE OF PROGRAM

The Office of Space Science (OSS) has developed a comprehensive approach for making education at all levels (with a particular emphasis on precollege education) and the enhancement of public understanding of space science integral parts of all of its missions and research programs. Key documents that establish the basic policies and guide all OSS Education/Public Outreach (E/PO)activities are a strategic plan entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and an implementation plan entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996). Both may be obtained by selecting "Education and Public Outreach" from the menu on the OSS homepage at <http://www.hq.nasa.gov/office/oss/>), or from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001, USA.

In accord with these established policies, proposers to this AO are required to include an E/PO component as part of their scientific research proposal. In keeping with the OSS policy guidelines, up to 2% per year of the cost of the proposed investigation may be budgeted for E/PO activities. E/PO proposals will be evaluated (see criteria below) by appropriate scientific, education, and outreach personnel. The OSS Selecting Official will specifically take into account proposed E/PO tasks and their review ratings when deciding on final selections and funding levels. Results of these E/PO reviews will be used to aid in discriminating between research proposals having otherwise comparable merits, and reviews of E/PO proposals will be conveyed to the proposers as part of their debriefings.

In order to ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, E/PO proposals will be evaluated using the following specific criteria:

- The establishment of effective, long-duration partnerships with institutions and/or personnel in the fields of educational and/or public outreach as the basis for and an integral element of the proposed E/PO program;
- The potential of the proposed E/PO activity to have a "multiplier effect" (e.g., prospects for broad dissemination or replication of an E/PO product);
- For proposals dealing with the formal education system, the degree to which the proposed E/PO effort promotes nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;
- The degree to which the proposed E/PO effort contributes to the training of, involvement in, and broad understanding of science and technology by underserved and/or underutilized groups; and
- The prospects for building on, taking advantage of, and leveraging existing and/or ancillary resources beyond those directly requested in the proposal;

It is recognized that not all proposals can (or even should) address all of these factors and only the relevant subset will be considered in evaluating each individual proposal. In addition, the following general criteria also will be considered in evaluating all proposals:

- The quality, scope, and realism of the proposed E/PO program;
- The capability and commitment of the proposer to carry out the proposed E/PO program;
- The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity;
- The linkage of the proposed E/PO task with existing NASA science and/or education programs and activities; and
- The adequacy and realism of the proposed budget (including any additional resources outside those requested from NASA).

Note that originality of the proposed effort is not a criterion. Rather, NASA OSS seeks assurance that the Principal Investigator is personally committed to carrying out a meaningful, effective, credible, and appropriate E/PO activity.

II. ASSISTANCE FOR THE PREPARATION OF E/PO PROPOSALS

To directly aid space science personnel in identifying and developing high quality E/PO opportunities, and establishing partnerships between the space science and E/PO communities, NASA OSS has established a national space science education/outreach infrastructure. The purpose of this infrastructure is to provide the coordination, background, linkages, and services needed for a vital national, coordinated, long-term E/PO program. Of particular interest are two elements of this system (which is described in more detail in the OSS E/PO implementation plan referred to above):

(i) Four OSS science theme oriented "E/PO Forums" have been established to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs and provide ready assess to relevant E/PO programs and products to both the space science and education communities.
(ii) Five regional E/PO "Broker/Facilitators" have also been selected to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities to be disseminated regionally and nationally.

Prospective proposers are strongly encouraged to make use of these infrastructure resources to help identify suitable E/PO opportunities and arrange appropriate alliances. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening "Education and Public Outreach" from the menu of the OSS homepage at <http://www.hq.nasa.gov/office/oss/>.

III. PROGRAMMATIC INFORMATION

The guidelines for the preparation and submission of the E/PO component of a research proposal submitted in response to this AO are:

- The body of an E/PO proposal should be restricted to the page length indicated in Table B-1 of this AO and include the following information: A brief abstract of the proposed program; an expanded description of the objectives and planned activities; a description of the intended involvement of the Principal Investigator of the research proposal, as well as that of any additional personnel who are proposed to be responsible for the E/PO effort and/or the respective institutional responsibilities if a partnership is proposed; and a statement and explanation of the E/PO budget.
- The budget for the E/PO activity should be integrated into that for the parent research proposal as specified elsewhere in this AO. The period of performance of an E/PO activity is restricted to that of the parent proposal.
- The hard-copy E/PO proposal should be bound as part of the total proposal in the order specified elsewhere in this AO.
- E/PO proposals are also to be submitted electronically by uploading its text to the secure Web site at URL <http://cass.jsc.nasa.gov/panel/>, which provides complete instructions for this activity using a wide variety of formats. Proposers without access to the Web or who experience difficulty using this site may request assistance by E-mail to <panel@lpi.jsc.nasa.gov> or by phone at (281) 486-2156 or -2166.

Questions about an E/PO program may be directed to:

Dr. J. David Bohlin
Code SR
Office of Space Science
NASA Headquarters
Washington DC 20546-0001
Telephone: (202) 358-0880
E-mail: jbohlin@hq.nasa.gov